Case Report

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A Case of Successful Treatment Using Tibiopedal Arterial Minimally Invasive Retrograde Revascularization for an In-Stent Occlusion Starting from the Origin of the Superficial Femoral Artery

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Abstract

An 86-year-old man with a history of peripheral artery disease (PAD) presented with intermittent claudication of the right leg. He was treated with two self-expanding stents for occlusion of the proximal and mid lesions of the right superficial femoral artery (SFA) 2 years ago, via an antegrade approach. Six months after the initial procedure, conventional balloon angioplasty was performed for the first in-stent occlusion of the right SFA. However, 18 months after the second procedure, contrast-enhanced computed tomography revealed in-stent occlusion in the right SFA again. The occlusion started from the SFA's origin; therefore, we chose tibiopedal arterial minimally invasive retrograde revascularization (TAMI), an endovascular treatment technique, to accurately position a self-expanding stent, which covered the origin of the SFA and overlapped with the proximal edge of the preplaced stent. This resulted in an excellent angiographic finding with brisk runoff into the posterior tibial artery. Our case demonstrated that the usefulness of TAMI in self-expanding placement when treating PAD with an occlusive lesion that starts from the origin of the SFA.

Keywords: Peripheral artery disease; Superficial femoral artery; Tibiopedal arterial minimally invasive retrograde revascularization

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Introduction

Self-expanding stents are often used for the endovascular treatment (EVT) of the superficial femoral artery (SFA) in patients with peripheral artery disease (PAD). However, it is sometimes difficult to optimally position the proximal side of the self-expanding stent because the stent expands from the distal to the proximal portion of the target artery when using the conventional antegrade approach. Tibiopedal arterial minimally invasive retrograde revascularization (TAMI), an EVT technique, has recently been developed to help avoid mispositioning of the self-expanding stent. Herein, we present a case wherein we used TAMI with optimal stent positioning to successfully treat a patient with PAD with an occlusive lesion from the origin of the SFA and obtained excellent angiographic results.

Case Report

An 86-year-old man with a history of PAD and chronic kidney disease (CKD) presented with intermittent claudication of the right leg. He was treated with two self-expanding stents (LifeStent™, Becton, Dickinson and Company, NJ, USA) for occlusion of the proximal and mid lesions of the right SFA 2 years ago, via an antegrade approach. Six months after the initial procedure, conventional balloon angioplasty was performed for the first in-stent occlusion of the right SFA (Figure 1). However, 18 months after the second procedure, contrast-enhanced computed tomography revealed in-stent occlusion in the right SFA again. The occlusion started from the origin of the SFA; therefore, we chose TAMI to accurately position a self-expanding stent, and surely cover the SFA's origin. Using ultrasound guidance and a micropuncture needle, a 6 Fr hydrophilic coated introducer sheath (Glidesheath Slender®, Terumo, and Tokyo, Japan) was inserted into the right posterior tibial artery (PTA) (Figure 2). Selective arteriography via this sheath showed total occlusion of the SFA at the distal edge of the preplaced stent (Figure 3).

An intravascular ultrasound (IVUS)-guided parallel single wire technique (Detach and Go) was used to cross the guidewire through the occlusion site. First, a 6 Fr guiding catheter (Brite Tip® (Peripheral), Cordis®, Cardinal Health Inc., OH, USA) was advanced near the occlusion site. Then, both IVUS (Eagle Eye Platinum Short Tip, Philips Japan, Tokyo, Japan) and a 0.014-inch guidewire (Gladius guidewire; Asahi Intecc, Nagoya, Japan) were advanced in the occlusion site by IVUS preceding. Since IVUS strayed to the subintimal space after passing through the occluded preplaced stent, the guiding catheter was further advanced to the site where the true lumen could be confirmed, and the guidewire was pulled out about 30 cm to separate it from IVUS. Although we tried to advance the guidewire through the true lumen according to the IVUS information, it did not easily pass through. Therefore, we exchanged it for another 0.014-inch guidewire (Astato XS9-40, Asahi Intecc, and Nagoya, Japan) and consequently succeeded in passing through the true lumen. After predilatation of the occlusion site using a general balloon, an 8.0 x 40 mm self-expanding stent (SMART®, Cordis®, Cardinal Health Inc., OH, USA) was placed to cover the origin of the SFA and overlap with the proximal edge of the preplaced stent in the SFA, resulting in an excellent angiographic finding with brisk runoff into the PTA (Figure 4). Hemostasis of the PTA access site was achieved by manual compression within a short time (approximately 5 min). The patient's claudication improved.

Figure 1: Contrast-enhanced computed tomography. Proximal (A) and Distal (B) edges of the in-stent occlusion.

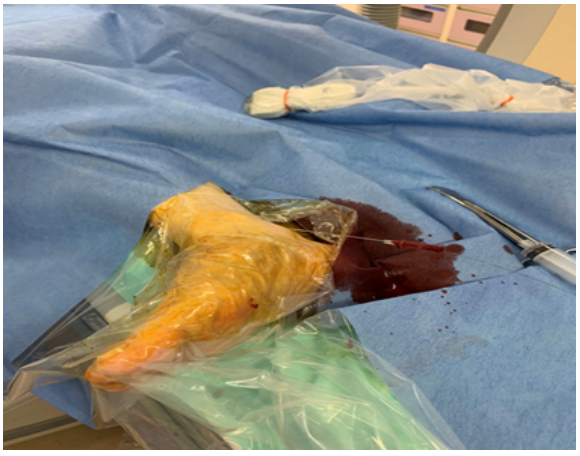

Figure 2: Ultrasound-guided posterior tibial artery puncture.

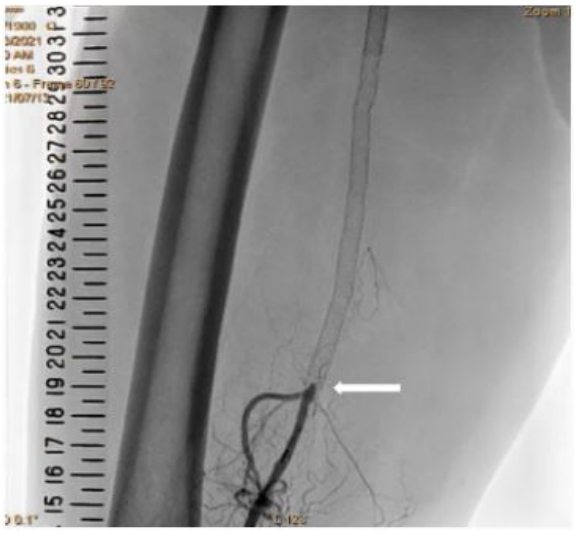

Figure 3: Selective arteriography via sheath. White arrow shows in-stent occlusion at the distal edge of the preplaced stent.

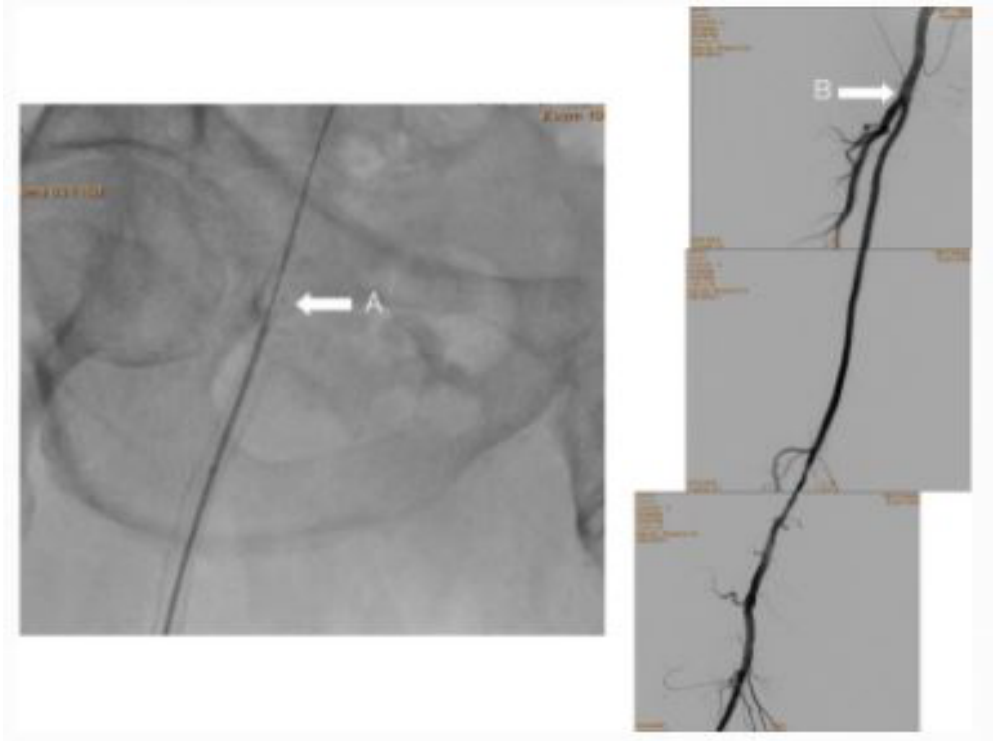

Figure 4: Arteriography after stenting.

Discussion

PAD affects 12% of the adult population and up to 20% of individuals aged 70 years or older. The prevalence and incidence of PAD are increasing due to calorie-rich diets, hypertension, diabetes, tobacco use, and a sedentary lifestyle [1-3]. Although most patients with symptoms of claudication should initially be treated with medications and/or exercise therapy [4], EVT can be considered when the patient's symptoms do not improve. The treatment strategy of EVT or bypass surgery is generally determined depending on the complexity of the lesion according to the TASC (The Trans-Atlantic Inter-Society Consensus Document on Management of Peripheral Arterial Disease) classification [5]. EVT in patients with advanced PAD has evolved drastically over the past decade, owing to a better understanding of the atherosclerotic process [6]. Although EVT has traditionally been performed using an antegrade approach via the common femoral artery (CFA), this technique has several limitations, including major bleeding at the puncture site, which requires long-time supine position after EVT, and renal impairment due to the excessive contrast media use [7]. Moreover, it is sometimes difficult to optimally position the proximal side of

the self-expanding stent when using the conventional antegrade approach, because the self-expanding stent expands from the distal to proximal portion of the target artery.

Recently, TAMI, an EVT technique, has been introduced to mitigate these risks and improve the safety of EVT. TAMI utilizes a single transtibial artery access using a micropuncture needle and a transpedal sheath. The entire angiography and revascularization procedures are then performed via a retrograde approach from the tibiopedal access. As the self-expanding stent expands from the proximal to the distal portion of the target artery in the TAMI, the proximal side of the self-expanding stent can be placed in the ideal position. Mean diameters of tibial and radial arteries are 2.7 mm and 2.3 mm, respectively, which are not massively different [8]. Therefore, haemostasis can be achieved easily by manual compression or using radial compression devices. In addition, the patient is not required to remain in a supine position for a long time following EVT. Since contrast media can be removed from the catheter, the risk of renal impairment may also be reduced [9]. In a recent large-scale retrospective multicentre analysis that enrolled 744 patients who underwent 1,195 EVT for advanced PAD and critical limb ischemia, 101 patients who underwent TAMI demonstrated the safety and feasibility of this technique.

Despite the many advantages of the TAMI compared with the conventional approach, the TAMI also has several limitations, including an occlusion of the punctured blood vessel and difficulty of ultrasound-guided puncture [10].

In the present case, since the patient had an occlusion including the origin of the SFA, we thought that positioning of the proximal side of the self-expanding stent was quite important to obtain satisfactory revascularization in this EVT. In addition, since the patient had CKD, saving contrast media use was also required. Therefore, we decided to perform TAMI at this time for the repetitive occlusive lesion. Consequently, the self-expanding stent was successfully placed in the ideal position without any complications. Although the angiographic result was excellent with brisk runoff into the PTA, long-term results of TAMI have been underreported. Thus, long-term follow-up is necessary to determine the true efficacy of TAMI.

Conclusion

TAMI is a feasible method for treating patients who are at risk of CFA puncture, such as those with easy bleeding, obesity, and high branching. It is also a useful for treating patients in whom the supine position cannot be maintained for a long time due to conditions such as heart failure and scoliosis. In addition, TAMI would be useful for the treatment of PAD with an occlusive lesion from the origin of the SFA, such as in this case.

Disclosure

Dr. Kodani received remuneration from Daiichi-Sankyo and Ono Pharmaceutical. The other authors declare no conflicts of interest.

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